

**iCE 3000 Series
Pre-Installation Manual**

Version 1.2

Part number 9499 500 30031

2008 Thermo Fisher Scientific. All rights reserved.

Registration No. 441506

SOLAAR House
19 Mercers Row,
Cambridge CB5 8BZ,
United Kingdom.
Telephone +44 (0) 1223 347400,
Fax +44 (0) 1223 347402,
<http://www.thermofisher.com>

This page is intentionally blank

Contents

	Contents.....	3
Chapter 1	Introduction	5
Chapter 2	System Accessories.....	7
Chapter 3	Transportation	9
	Package Size	9
	Short Term Storage.....	10
	Transit Damage.....	10
	Warranty	10
Chapter 4	Working Area Requirements.....	13
	Introduction	13
	Location.....	13
	Environmental Requirements	14
	Electrical.....	14
	Spectrometer Size	15
	Gas Requirements	16
	Water Temperature Control.....	18
	Waste Storage	19
	Spectrometer Fume Extraction	19
	Sample Fume Extraction	21
Chapter 5	Communications Interface	22
	On the Data Station	22
Chapter 6	Pre-Installation Checklist	24
Chapter 7	Special Agreements.....	26

This page is intentionally blank.

Chapter 1

Introduction

This manual is designed to help ensure that your iCE 3000 Series AA Spectrometer will be installed efficiently and will be able to meet your requirements quickly and completely.

It will minimise installation time if the services and facilities detailed here are available before the equipment is delivered.

Properly installed and maintained, your system will provide you with years of reliable service. Please inform your local Thermo Fisher organisation what aspects of support are most important to you and a tailored agreement can be provided to prolong the life of your instrument. Contact details for your local support office are at the end of this document.

This manual describes the environment and the resources required at the installation site of the iCE 3000 Series AA Spectrometer and associated equipment. Safety requirements for the installation are also detailed.

WARNING: The installation of all services must comply with the appropriate rules and regulations required by the local authorities responsible for those services in the workplace at the installation site. An installation engineer is not responsible for the fitting, or compliance of the facilities, or services.

The choice of an operating site for the instrument will be influenced by local considerations, for example ease of access and availability of electrical power.

Logical planning of the installation can save both time and money. The objective of this manual is to provide information that will enable the best site to be chosen and to highlight the essential requirements.

If further information or advice is required, contact your local Thermo Fisher organisation. A list of Thermo Fisher organisations and agents can be found on <http://www.thermofisher.com>

Installation of the system will include some familiarisation training; however comprehensive method development and software training will require additional training that should be ordered separately.

Chapter 2

System Accessories

Required:

- Data Station (see specification)

Optional:

- Integrated Graphite Furnace and Autosampler
- GFTV for iCE 3300
- SOLAAR Validator Package
- SOLAAR*security* Software
- ID100 Auto Dilutor
- VP100 Continuous Flow Vapour System
- EC90 Electrically Heated Atomisation Cell
- Slotted Tube Atom Trap
- Air Compressor
- Cetac ASX-520 Autosampler
- Cetac ASX-260 Autosampler
- Water Recirculator

Please request site requirement guides for any purchased accessories

This page is intentionally blank.

Chapter 3

Transportation

The spectrometer is supplied with all compatible accessories that have been purchased to meet the customer's system requirements. Items may be shipped in separate packages.

WARNING: All items should be transported to the installation site on pallets, in their original packaging and the right way up. Under no circumstances may any package be moved without its pallet unless under the direct control of an authorised Thermo Fisher service engineer.

Proposed routes from the customer receiving area to the installation site must be checked for suitability. The largest pallet size should be used to calculate clearances.

WARNING: The boxed Spectrometer and the Graphite Furnace Power Supply should be moved using a mechanical lift. To avoid injury four people should be used when taking the equipment from its box by hand, appropriate precautions should be taken. Care should also be taken in doorways, corridors or when lowering to avoid trapping fingers.

Package Size

The instrument and accessories will be supplied inside especially designed packaging. The dimensions are:

Table 3–1. Spectrometer Packaged Dimensions and Weight

	Width	Depth	Height	Weight
iCE 3500	1070mm (42.2in)	740mm (29.2in)	760m (30in)	64Kg (141lbs)
iCE 3400	1070mm (42.2in)	740mm (29.2in)	760m (30in)	60Kg (132lbs)
iCE 3300	660mm (26in)	700mm (27.6in)	760mm (30in)	43Kg (95lbs)

Table 3–2. Accessory Packaged Dimensions and Weight

	Width	Depth	Height	Weight
Furnace	715mm (28.2in)	550mm (21.7in)	620mm (24.5in)	57Kg (126lbs)
Zeeman Furnace	715mm (28.2in)	550mm (21.7in)	720mm (28.4in)	71Kg (157lbs)
Furnace Autosampler	510mm (20.1in)	420mm (16.6in)	530mm (20.9in)	10Kg (22.1lbs)
EC90	720mm (28.4in)	620mm (25.5in)	350mm (13.8in)	20Kg (44.1lbs)
VP100	690mm (27.2in)	500mm (19.7in)	400mm (15.8in)	9.5Kg (21lbs)

Transportation to some destinations may necessitate additional packaging, for example a packing crate. Dimensions and exact specifications may vary.

Short Term Storage

To maintain the instrument in serviceable condition and to comply with the conditions of warranty, ensure that storage of each item is maintained within the stated parameters detailed for the Working Area Requirements below. Make sure that the packages are stored the correct way up.

Note: Do not open the Packages without the permission of the Thermo Fisher engineer

When the packages are opened prior to installation, the contents will be checked against the packing list(s).

Spectrometers ordered with Validation packages should not be opened other than by the trained Service Engineer performing the installation.

Transit Damage

Before accepting delivery of any equipment, the packages should be inspected for signs of obvious damage. The nature of the damage should be noted on the delivery notice and signed by the carrier's representative.

Within the time stated in the Thermo Fisher terms and conditions an inspection should be made for concealed damage. The local Thermo Fisher organisation should be advised of any damage in writing and, on receipt of specific instructions, the customer should return the equipment complete and in the original packing material.

Warranty

The instrument is warranted against defects in material and workmanship for a period of 12 months from installation, or 15

months from shipment, whichever comes first. This warranty does not cover damage sustained as a result of improper storage by the customer prior to installation, or resale to a third party.

Note: Warranty is not transferable to a third party without Thermo Fisher approval.

This page is intentionally blank.

Chapter 4

Working Area Requirements

The choice of site will be influenced by the dimensions and weights of the spectrometer and accessories. Other factors are the environment and the availability of electricity, water and gas supplies, as well as the need for a suitable ventilation system to dispose of the exhaust gases. All of these factors are covered in the following sections.

Pre-installation visits can be made on request, but may be chargeable.

Introduction

Prior to installation make sure that the proposed area is compatible with the conditions specified. The laboratory must offer a dry, even temperature and dust-free conditions, with no possibility of condensation forming. Sample preparation activities and corrosive materials should be located in a separate room to avoid problems due to corrosive fumes.

A comprehensive ‘Risk Assessment’ should be carried out that is specific to the handling of solvents, samples and sample preparation.

Particular consideration should be taken to avoid direct sunlight, proximity to heat sources, draughts and vibration. Do not locate the system where sudden changes in temperature can occur, for example near a door or window, care should be taken with the location of items such as air conditioning vents and heating vents.

Location

The instruments are designed for use on a normal laboratory bench. Ideally the instrument should be placed on a moveable bench with 0.5 meters of access behind the instrument. The mounting surface must be level and the instruments must not be placed on any type of cushioning as this could block ventilation.

All electrical, gas and extraction should be capable of being controlled within 0.5 meters of the installed instrumentation.

The mounting arrangements should be capable of supporting the weight of the spectrometer and its accessories. Make sure that the working surface is sufficiently rigid to prevent vibration as this may affect the optical alignment of the spectrometer and accessories.

To avoid the possibility of liquid ingress into the top of the spectrometer the location should ensure it is not possible to store sample or other liquids directly above the instrumentation.

Organic, volatile, or strongly acidic solvents should not be stored, even for a short time, near the instrument.

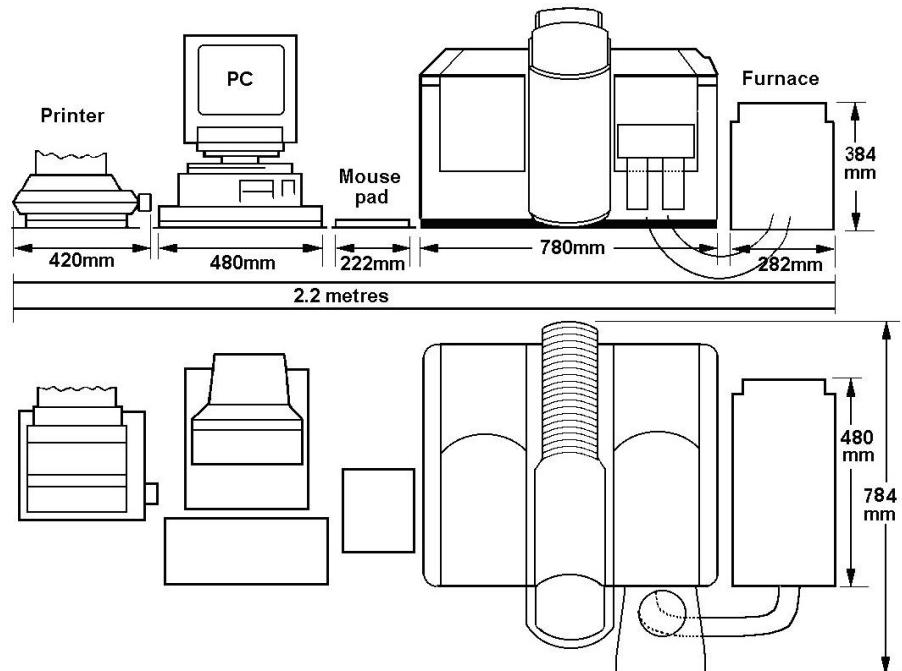


Figure 4–3. iCE 3500 Series typical location diagram.

Do not position the equipment so that it is difficult to operate the extraction, electrical supply, cooling water , gas controls.

Environmental Requirements

The atmospheric temperature requirement is 5 to 40°C (41 to 104°F), The temperature should not change by more than 2°C per hour.

Atmospheric humidity should be 20 to 80% m/v for an ambient temperature between 5 and 30°C and 20 to 60% m/v for an ambient temperature between 30 and 40°C. Atmospheric conditions must be non-condensing. The instrument room should be at a positive pressure with respect to rooms with a corrosive atmosphere.

Electrical

The spectrometer will require an electrical supply at 100 to 240VAC, 300VA, 50/60Hz. The spectrometer will be supplied with a 2m mains cord with USA type or Non USA (rest of world) type coding. USA coding is black (X – ac high), white (Y – ac low), green (G – earth/ground). Rest of World coding is blue (neutral), brown (live), green/yellow (earth/ground).

The furnace power supply unit will require a single phase mains supply of 200/240VAC, 7.2KVA, 50/60Hz. In normal operation the furnace power supply may draw surge currents in excess of the nominal rating. A dedicated supply should be used which may require the inclusion of delayed action protection devices such as circuit breakers or motor start fuses

Within the EU in order to comply with IEC the furnace power supply unit should be connected to a supply with an impedance of 0.124 Ohms or less. It is the responsibility of the user of the unit to ensure by consultation with the local supply authority if necessary, that the unit is connected to this type of supply.

An additional 220/240VAC, 1.5KVA, 50/60Hz is required for a Zeeman furnace power supply unit.

Other accessories will require a single phase mains supply 110/120V, or 200/240V at 50/60Hz. The requirements are:

EC90, 720VAC

VP100, 125VAC

ID100, 100VAC

Connection to the laboratory supply should be with an appropriately rated plug conforming to local electrical guide lines and local requirements. It must be possible to electrically isolate the instrumentation.

Multiple installations will require separate mains supplies.

Additional standard mains sockets will be required for the Data Station and printer, for an extended autosampler, for a chiller and for each additional accessory used.

Each electrical outlet must have an effective earth/ground connection. This protection must not be negated by the use of an extension cable without a protective earth conductor.

Spectrometer Size

Table 4–1. Spectrometer Dimensions and Weight

Spectrometer Size	Width	Depth	Height	Weight
iCE 3500	788mm (31.0in)	594mm (23.3in)	529mm (20.8in)	54Kg (119lbs)
iCE 3400	788mm (31.0in)	594mm (23.3in)	529mm (20.8in)	50Kg (110lbs)
iCE 3300	575mm (22.6in)	594mm (23.3in)	529mm (20.8in)	33Kg (72.6lbs)

Table 4-2. Accessory Dimensions and Weight

	Width	Depth	Height	Weight
Furnace	265mm (10.4in)	495mm (19.5in)	390mm (15.4in)	50Kg (110.2lbs)
Zeeman Furnace	265mm (10.4in)	495mm (19.5in)	390mm (15.4in)	66Kg (145.5lbs)
Furnace Autosampler	296mm (11.7in)	320mm (12.6in)	380mm (15in)	7.3Kg (16.1lbs)
EC90	305mm (12in)	500mm (19.7in)	215mm (8.5in)	16Kg (35.3lbs)
VP100	340mm (13.4in)	360mm (14.2in)	280mm (11in)	8.5Kg (18.7lbs)

Gas Requirements

General

The spectrometer will use a flame or furnace to provide atoms that are analysed to indicate the concentration of an element in an unknown sample. A flame will use acetylene as the fuel and either air or nitrous oxide will be required as the oxidant for the flame. A nitrous oxide flame will also require air to allow the system to ignite and stabilize before a nitrous oxide flame is used.

Care should be taken to ensure that laboratory gas lines are gas tight, free from oil and grease, and do not contaminate the gases used for the spectrometer.

Gas cylinders must be stored and operated in a vertical position and in an environment free from naked lights and sparks. Cylinders should be left to stabilize overnight before use.

Only the gas tubing supplied with the spectrometer should be used. The gas tubing supplied will terminate in 3/8in BSP thread connections.

All gas supplies should be regulated at the cylinder/ liquid gas tank and at the instrument. The connection to the instrument gas pipes should be within 1 meter of the instrument.

A comprehensive ‘Risk Assessment’ should be carried out that is specific to the gas requirements.

Acetylene

A flame spectrometer will require acetylene at 0.62bar (9psi) with flow rates of between 0.8 and 5.1lmin⁻¹. The purity must be at least

98.5%, with impurities for sulphur and phosphorus of less than 15ppm, and water of less than 100ppm. The balance of the gas should be inert gas.

The instrument will be supplied with acetylene gas tubing terminating in 3/8in BSP Left Hand tighten thread connections.

Black iron is recommended for internal plumbing of acetylene.

It is recommended that banks of cylinders be used with switch over valves so that the gas supplies can be used continuously. The cylinders must be fitted with regulators which can provide an outlet pressure of at least 0.84bar (12psi).

A flashback arrestor must be fitted to pressure regulator outlets.

Acetylene is usually supplied in cylinders containing about 6.16m³ (220ft³) of the gas dissolved in acetone. As the acetylene is used the pressure in the cylinder will fall resulting in release of acetone that can lead to erratic results and possible instrument damage. A cylinder must be considered exhausted at 7bar (100psi).

The acetylene in the cylinder must be dissolved in acetone. Do not use acetylene that is dissolved in other solvents (for example DMF).

The cylinders should be stored and operated in a vertical position as far away from the instrument as the length of the fuel hose will permit and in an environment free from naked lights or sparks.

Caution: If pressures above 0.62bar (9psi) acetylene are used in the UK, the Health and Safety Executive of HM Factory Inspectorate must be informed and an Exemption Certificate obtained. Local and national regulations and guidelines must be followed at all installation sites.

Warning: Acetylene is a highly flammable gas that can form explosive compounds. Contact with copper, silver, and alloys containing these metals must be avoided. Fittings, filters, or tubing, containing copper, silver, or other acetylidy forming metals, must not be used.

Air

The spectrometer requires clean dry compressed air at a steady pressure at 2.1bar (30psi), with a flow up to 10lmin⁻¹.

If the graphite furnace is using air as an oxidant it requires a pressure of 1.03bar (15psi) and a flow rate of 0.2lmin^{-1} .

The air should be supplied by an oil free compressor at a pressure up to 4.14bar (60psi). A filter/ regulator unit is required that incorporates a 5 micron filter, a pressure regulator and a pressure gauge. A clear plastic Terylene reinforced link hose, of at least 3.5m (12ft) is required to cool the air and permit efficient water removal by the filter/regulator unit.

Argon and Nitrogen

A graphite furnace will require argon, or nitrogen, gas at 1.03bar (15psi) with a purity of 99.999%. Argon gas is the preferred purge gas.

A vapour system will require a pressure of 0.34bar (5psi).

Warning: Nitrogen and argon gas may cause asphyxiation at high concentrations. Appropriate care should be taken.

Nitrous Oxide

A flame spectrometer may require nitrous oxide gas for some applications. Nitrous oxide must be supplied at 2.75bar (40psi) at a flow of 8lmin^{-1} . Special grade AA nitrous oxide must be used with oxygen impurities of less than 150ppm; nitrogen less than 400ppm; carbon dioxide of less than 50ppm; oxides of nitrogen less than 2ppm; carbon monoxide less than 1ppm and water less than 15ppm . A two stage regulator is required to provide good precision and stable flame conditions. It maybe necessary to fit a heater to the regulator to prevent freezing, which would cause flow rate variations and an unstable flame.

Warning: Nitrous oxide is an anaesthetic and if inhaled in large amounts can be fatal. The gas supports combustion to a higher degree than air and will produce highly combustible mixtures very readily.

Water Temperature Control

A recirculating chiller should be used to remove waste heat from the graphite furnace. The water temperature should be set to 5°C below the ambient temperature.

The flow requirement of the furnace is 0.7 l/min and the pressure should be between 1.4 and 6.9bar (20 to 100psi). The chiller must have a cooling capacity in excess of 900W.

A suitable chiller (ThermoFlex 900) can be supplied from your local Thermo Fisher organisation.

Requirements for ThermoFlex 900:

Power: 230V, 50Hz, 7A; or 115V, 60Hz, 13A

Dimensions: 696 x 361 x 627mm (27.4 x 14.2 x 24.7in)

The furnace will be supplied with plastic connecting tubing that has a 6.5mm **inside** diameter.

Connection to the water chiller should be within 3 meters of the instrument. If greater distance is required insulated tubing must be used.

A suitable fungicide, or biocide, should be added to the water. This can be recommended by the supplier of the chiller.

Waste Storage

The analysis of a sample, by flame atomic absorption, usually involves production of a fine mist from a liquid sample. Waste will be produced that could be corrosive and toxic, or an organic solvent. An appropriate container is required that is solvent proof, shatterproof and vented away from the instrument. Ensure the waste container does not constitute a spill or trip hazard.

The waste vessel must have a wide neck, be made of a shatterproof material and resistant to attack by the chemicals used in the analysis. Polythene is suitable in most cases.

It may be necessary to neutralise waste to prevent any toxin build up. Appropriate facilities should be provided for the disposal of any waste which should be disposed of following local procedures and regulations.

Warnings: The lower end of the drain extension must always be above the level of the liquid in the drain vessel.

Glass or metal drain vessels must not be used.

The drain extension tube must provide a free flowing drain outlet, to prevent the formation of any additional 'U' traps, and must be free of kinks and sharp bends.

Spectrometer Fume Extraction

The spectrometer is designed to operate in clean air conditions. The laboratory must be free of all contaminants that could have a degrading effect on the instrument components.

Dust, acid and organic vapours must be excluded from the work area. The warranty will be void if the equipment is operated in substandard conditions.

WARNING: The spectrometer must never be operated without an effective fume extraction system installed above the sample

compartment. The fume extraction hood must not be attached to the chimney and an air gap of 128mm (5in) to 230mm (9in) must be made. For twin sample compartment instruments two hoods will be required.

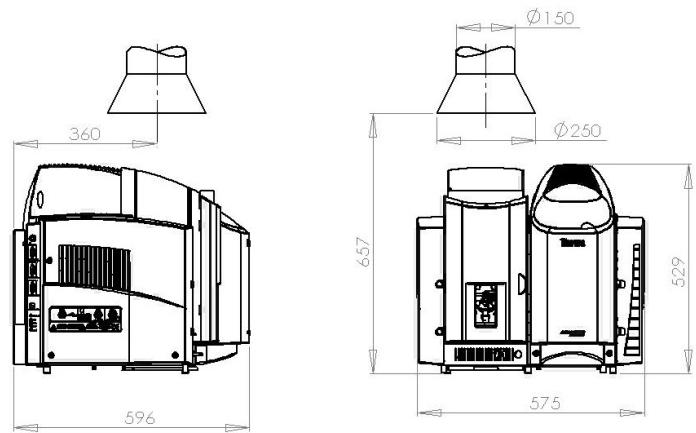
An acetylene flame can generate between 3 and 5kW with temperatures up to 3000°C. The fumes from the flame, which may be corrosive and toxic, are discharged from the instrument chimney during operation. To ensure a safe working environment and safe removal of waste combustion products an effective extraction system must be installed; this should include appropriate filtering of hazardous toxic fumes.

It is recommended that the hood of the extraction system and ducting be made of stainless steel with a circular cross section of at least 150mm (6in). No compounds that may form acetylides should be in contact with exhaust fumes.

A centrifugal fan, preferably with plastic coated metal blades, extracting at least 2800lmin⁻¹ (100ft³ min⁻¹) must be fitted into ducting connected to the hood over the flame. The fan must be at least 3m from the hood. The hood over the furnace must extract 200lmin⁻¹. Suitable extraction should also be used for the EC90.

Caution: The instrument must not be installed in a normal chemical fume cupboard as the ventilation is likely to be inadequate and any other chemical operation may damage the spectrometer.

The extraction system must not be affected by external weather conditions, or other uses the system may be used for.



iCE 3300 Series, extraction position.

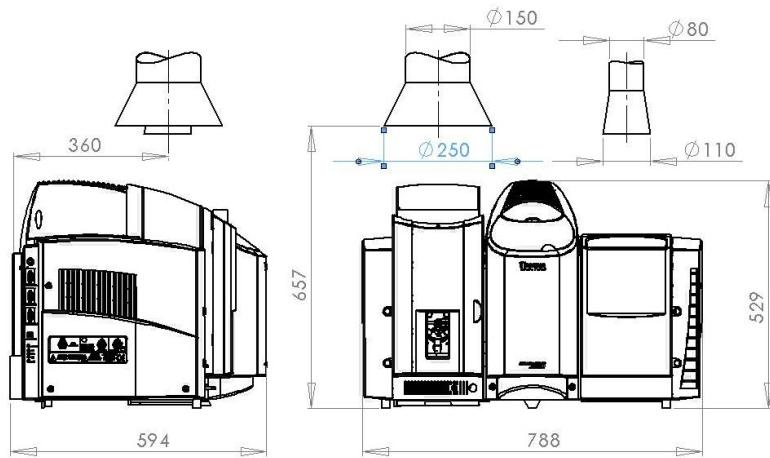


Figure 4-4.. iCE 3400/3500 Series, extraction position.

Sample Fume Extraction

Additional, separate, extraction should be considered if significant numbers of volatile or acidic samples are left in the proximity of the instrumentation, even those in an autosampler.

Chapter 5

Communications Interface

On the Data Station

The Data Station requirements will normally be met by a PC meeting the following minimum specification:

- Windows XP Professional (Service pack 2 or later), Windows Vista Ultimate.
- 20Gb Hard drive
- 512 Mb RAM
- A USB connection for spectrometer communication
- Some accessories require a dedicated RS232 port
- An Ethernet card will be required for networking
- A printer port may be required

A suitable PC is available from your local Thermo Fisher organisation.

The installation engineer is not responsible for network and customer specific set-up of the PC.

This page is intentionally blank.

Chapter 6

Pre-Installation Checklist

This checklist is to be filled in by the customer to confirm that all relevant factors concerned with the installation have been considered and dealt with. On completion of the list, a copy should be forwarded to your local Thermo Fisher organisation with a request for installation to be carried out. Failure to send the checklist may result in delays with the instrument installation; any delays may incur extra charge.

Table 6–2. Pre-Installation Checklist

Action	Completed?
Work area prepared	<input type="checkbox"/>
Location of units planned	<input type="checkbox"/>
Suitable work benches provided	<input type="checkbox"/>
Fume extraction system installed and commissioned.	<input type="checkbox"/>
Electrical socket outlet available for: Spectrometer (domestic)	<input type="checkbox"/>
Furnace (conditional – see Chapter 4 Electrical)	<input type="checkbox"/>
Data station (domestic)	<input type="checkbox"/>
Chiller (domestic)	<input type="checkbox"/>
Autosampler (domestic)	<input type="checkbox"/>
Other accessories (domestic)	<input type="checkbox"/>
Drain/waste container available	<input type="checkbox"/>
Gas supplies available and tested with correct size fittings (3/8in BSP): 2.1bar (30psi) air; 0.62bar (9psi) acetylene; 2.1bar (30psi) for argon/nitrogen; 2.75bar (40psi) nitrous oxide.	<input type="checkbox"/>
Cooling water (6.5mm id plastic tubing supplied with instrument)	<input type="checkbox"/>
18 MΩ/cm ³ water required for testing	<input type="checkbox"/>
Test and set-up solution.	<input type="checkbox"/>
SolaarSecurity (optional) and Validation (optional) The following manuals are required by the customer to enable preparation prior to instrument installation IQ 1) SolaarSecurity pre-installation procedure	<input type="checkbox"/>
2) SolaarSecurity Software installation manual	<input type="checkbox"/>
3) Security Administration Users Guide	<input type="checkbox"/>

Contact details for your local Thermo Fisher Organisation should be below, or are available from:
technicalsupport.sid.cambridge@thermofisher.com

Chapter 7

Special Agreements

This section should detail any special agreements, which have been arranged with your local Thermo Fisher organisation.

This page is intentionally blank.